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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE	*Application No.*	**09/424,210**
	Filing Date	**November 22, 1999**
	First Named Inventor	**TSCHUDI**
	Group Art Unit	**2623**
	Examiner Name	**LAROSE**
	Attorney Docket No.	**2800-107**
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Title of the Invention: METHOD AND APPARATUS FOR MEASURING STRUCTURES IN A FINGERPRINT

APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

MS Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The following comprises the Appellants' Brief on Appeal from the final rejection, dated February 25, 2003, of claims 15-28. This Appeal Brief is filed in triplicate and is accompanied by the required appeal fee set forth in 37 C.F.R. § 1.17(c). Appellants' Notice of Appeal was filed on August 22, 2003. Therefore, the present Appeal Brief is timely filed.

I. REAL PARTY IN INTEREST

The real party in interest is the assignee of the present application, Sintef of Trondheim, Norway.

II. RELATED APPEALS AND INTERFERENCES

Appellants state that, upon information and belief, they are not aware of any co-pending appeal or interference which will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

This is an appeal from the final rejection dated February 25, 2003 (Paper No. 13), wherein claims 15-28 were rejected. Claims 15-17 and 20-28 were rejected under 35 U.S.C. § 112 (¶1) as not supported by the original disclosure, and claims 15-28 were rejected under 35 U.S.C. § 102 or § 103 on prior art grounds. Following appellant's response to the February 25 Office Action, the Examiner issued an Advisory Action on July 10, 2003 (Paper No. 16) in which all rejections, except the rejection of dependent claim 17 under 35 U.S.C. § 103, were maintained. It was indicated that claim 17 would be allowable if rewritten to include all limitations of the claims from which it depended and if the rejection under 35 U.S.C. § 112 (¶1) were overcome.

The rejections of claims 15-16 and 18-28 – as well as the rejection of claim 17 to the extent that it is rejected as dependent on claim 15, rejected under 35 U.S.C. § 112 (¶1) – are on appeal.

The present application was originally filed with claims 1-14. On January 29, 2003, applicants cancelled claims 1-14 and replaced them with claims 15-28. Claims 15-28 are the only claims pending.

Claims 15-28 are set forth in the appendix to this Brief.

IV. STATUS OF AMENDMENTS

Claims 15-28 have not been amended since their introduction with the Amendment filed January 29, 2003. There have been no amendments filed after the final rejection.

V. SUMMARY OF THE INVENTION

The invention will be summarized by reading the appealed claims onto the specification and drawings. See MPEP §1206, at 1200-10.

As recited in independent claim 1, one aspect of the invention is embodied in a method for sensing the features of a fingerprint. The method involves generating a plurality of

measurements, or, images, of the fingerprint surface by measuring structural features of the fingerprint (i.e., ridges and valleys) at specified intervals of time with a sensor array that is essentially one-dimensional as the fingerprint surface is moved perpendicularly to the array. (Page 3, lines 29-34; page 2, lines 2-13). The plurality of image is thereafter combined to form an image of the fingerprint surface. The two-dimensional image of the fingerprint surface is formed from only non-overlapping images by determining which of the generated images overlap one another and disregarding the overlapping images. (Page 5, lines 25-35).

As recited in dependent claim 16, another aspect of the invention is embodied in a method as described above in which the one-dimensional array comprises at least one line of equally spaced measuring points at which the measurements, or images, of the fingerprint surface are made. (Figures 1A, 1B, 2A, 2B, element 1; page 3, line 28 - page 4, line 6).

As recited in dependent claim 17, the invention is further embodied in a method as described above in which the measuring is simultaneously performed at each of the measuring points (1), the measuring points are arranged in at least two generally parallel lines spaced apart by a distance that is different from the distance separating the measuring points within each line, and the measuring points of one line are shifted with respect to the measuring points of the next line. (Figures 1B, 2A, 5; page 2, lines 39 - page 3, line 6; page 4, lines 18-19).

As recited in independent claim 18, the invention is also embodied in a method of sensing a fingerprint in which a varying voltage (12) is applied to a finger that is positioned over an electrode. (Figures 3-5, elements 12, 2, 14; page 6, lines 31-33). Thereafter, the capacitance or impedance between the electrode (Figures 1A, 1B, 3, element 2; Figure 5, element 14) and a capacitive sensor array (Figure 1A, 1B, 3, element 1; Figure 5, element 1) is measured through a finger that is positioned over both the electrode (2, 14) and the capacitive sensor array (1). As shown in Figures 1A, 1B, 3, 5, the sensor array (1) is separately disposed from the electrode (2, 14). The sensor array is adapted to detect variations in the capacitance or impedance across the array caused by structural features of a portion of the fingerprint surface positioned over the array. (Page 3, line 35 - page 4, line 2; page 6, lines 31-33).

As recited in dependent claim 19, the invention is further embodied in a method as described above which also comprises the step of forming a two-dimensional image representing structural features of at least a portion of a fingerprint surface using the variations in capacitance or impedance as detected by the sensor array. (Page 3, lines 29-33; page 5, lines 27-28, 34-35; page 6, lines 19-22).

As recited in dependent claim 20 and independent claim 21, the invention is also embodied in a method which includes the steps of generating a plurality of images of different portions of the fingerprint surface by measuring the structural features of the surface at given time intervals with a sensor array as the fingerprint is moved relevant to the array. (Figures 2A, 2B; page 3, lines 29-34; page 5, lines 8-9, 23-24). The speed of movement of the fingerprint relevant to the array is determined at each of the measurement intervals by sensing the structural features of the fingerprint surface moving over two spaced-apart sensing elements separated by a known distance and determining the speed from the distance and the time lapse between passage of identical fingerprint features from one sensing element to the other. (Page 4, lines 7-12; page 5, lines 19-23). The ascertained speed is used to determine the required positioning of at least a portion of the images to form a two-dimensional image of the fingerprint surface. For example, as described in the preferred embodiment, the speed is used to determine which of the plurality of images are redundant (i.e., overlap) and can therefore be disregarded, or neglected. (Page 5, lines 25-35).

As recited in dependent claim 22, the invention is further embodied in a method as described above in which one of the two sensing elements used for determining the speed of the fingerprint surface comprises a sensor in the sensor array. (Figure 1B, element 1; page 4, lines 7-14).

As recited in dependent claim 23, the invention is further embodied in a method as described above in which each of the two sensing elements used for determining the fingerprint speed is disposed in a different one of two groups of sensing elements arranged in two spaced-

apart, generally parallel lines of sensing elements. (Figure 1B, 2A, 5, element 1; page 4, lines 13-14).

As recited in independent claim 24, the invention is further embodied in a method for sensing a fingerprint. The method includes the step of applying a varying voltage to a finger positioned over an electrode. (Figure 3, element 2, Figure 5, elements 12, 14; page 6, lines 14-17). The capacitance or impedance between the electrode and the sensor array is measured through a fingerprint surface positioned over both the electrode (2, 14) and the capacitive sensor array (1). (Page 3, lines 35 - page 4, line 2). The sensor array (1) is separately disposed from the electrode (2, 14). (Figures 1B, 5). The array of capacitive sensors (1) is adapted to detect variations in the capacitance or impedance across the array caused by structural features of the fingerprint surface. (Page 2, lines 7-11; page 3, line 39 - page 4, line 2). A plurality of images of different portions of the fingerprint is generated by measuring the structural features at given time intervals with the sensor array (1) as the fingerprint surface is moved relative to the sensor array (1) in a direction that is generally perpendicular to the array. (Figures 2A, 2B; page 3, lines 29-34; page 5, lines 8-9, 23-24). The speed of the fingerprint relative to the sensor array is determined by measuring features of the fingerprint at two sensors separated by a known distance and determining the speed from the distance and the time lapse between passage of identical fingerprint features over the two elements. (Page 5, lines 19-23). The ascertained speed is used to identify overlapping images, and the overlapping images are disregarded in constructing a two-dimensional image of the fingerprint surface from only non-overlapping images. (Page 5, lines 25-35).

As recited in independent claim 25, the invention is also embodied in an apparatus for sensing a fingerprint. The apparatus includes an essentially one-dimensional sensor array and associated circuitry for generating a plurality of images of different portions of the fingerprint by measuring fingerprint features at given intervals as the fingerprint is moved relative to the sensor in a direction that is generally perpendicular to the sensor array. (Figures 2A, 2B, 3, elements 1, 8, 9, 10; page 2, line 38 - page 3, line 6; page 3, lines 29-34; page 5, lines 8-9, 23-24). The apparatus includes at least one pair of spaced-apart sensing elements (1). The elements are

constructed and arranged to sense structural features of the fingerprint surface, to determine a time lapse between the passage of identical structural features over the elements, and to determine the speed of movement from the time lapse and the distance separating the elements. (Figure 1B, element 1; page 4, lines 7-14; page 5, lines 19-23). The apparatus also includes means for determining which of the images overlap each other and for constructing a two-dimensional image of the fingerprint from only non-overlapping images by disregarding those images which overlap each other. (Figure 3, elements 8, 9, 10; page 5, lines 25-35; page 5, line 39 - page 6, line 4).

As recited in dependent claim 26, the invention is also embodied in an apparatus as described above which further includes an electrode and associated circuitry constructed and arranged to apply a varying voltage to a finger positioned over the electrode with the sensor separately disposed from the electrode. (Figure 5, elements 1, 12, 14; page 3, line 37 - page 4, lien 2; page 6, lines 31-35). The sensor array (1) is constructed and arranged to measure the capacitance or impedance between the electrode (14) and the sensor array (1) through the finger and to detect variations in the capacitance or impedance caused by structural features of the fingerprint surface. (Id.).

As recited in dependent claim 27, the invention is also embodied in an apparatus as described above in which one of the two sensing elements for measuring the speed of the finger comprises a sensor (1) in the sensor array. (Figure 1B; page 4, lines 7-14).

As recited in dependent claim 28, the invention is also embodied in an apparatus as described above in which each of the two sensing elements for measuring the speed of the fingerprint is disposed in a different one of two groups of sensing elements arranged in two spaced-apart, generally parallel lines of elements. (Figures 1B, 2A, 5; page 4, lines 13-14).

VI. ISSUES

A. Whether claims 15-17 and 20-28 are unpatentable under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to

reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention.

B. Whether claims 15 and 16 are unpatentable under 35 U.S.C. §102(e) as being anticipated by Mainguet, US Patent 6,289,114 (Mainguet '114 or Mainguet).

C. Whether claims 18 and 19 are unpatentable under 35 U.S.C. §102(e) as anticipated by Setlak, US Patent 5,828,773 (Setlak '773 or Setlak).

D. Whether claims 20 and 24 are unpatentable under 35 U.S.C. §103(a) as being obvious over Setlak '773 in view of Mainguet '114 and Upton, US Patent 5,864,296 (Upton '296 or Upton).

E. Whether claims 21-23 and 25 are unpatentable under 35 U.S.C. §103(a) as being obvious over Mainguet '114 in view of Upton '296.

F. Whether claims 26-28 are unpatentable under 35 U.S.C. §103(a) as being obvious over Mainguet '114 in view of Upton '296 and Setlak '773.

VII. GROUPING OF CLAIMS

Claims 15-17 stand or fall together. Claims 18-19 stand or fall together. Claim 20 stands or falls alone. Claim 24 stands or falls alone. Claims 21-23 stand or fall together. Claims 25-28 stand or fall together.

VIII. ARGUMENTS

A. REJECTIONS UNDER 35 U.S.C. § 112 (¶1)

Claims 15-17 and 20-28 stand rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. Office Action of 2/25/03, Paper No. 13, at 2. For each of the rejected claims, the examiner indicated the claim limitation that is allegedly unsupported. See Paper No. 13 at 2-3.

Appellant respectfully submits that the rejection is improper. "The examiner has the initial burden of presenting by a preponderance of evidence why a person skilled in the art would not recognize in an applicant's disclosure a description of the invention defined by the claims. MPEP § 2163.04 (citing In re Wertheim, 541 F.2d 257, 263, 191 USPQ 90, 97 (CCPA 1976)). The Examiner has failed to meet this burden, merely stating in conclusory fashion that certain limitations are not described in the original specification.

In response to the Examiner's rejection, applicant submitted a response along with a declaration under 37 C.F.R. §1.132 by the inventor Jon Tschudi attempting to explain how the original specification does in fact describe the subject matter of the rejected claims. In the Advisory Action issued by the Examiner following applicant's response, the Examiner stated: "[r]egarding the rejections under 35 U.S.C. 112, Applicant's remarks and attached affidavit have been considered but do not overcome the rejections concerning the features in question." Advisory Action of 7/10/03, Paper No. 16, at continuation sheet (PTO 303). The Examiner failed, however, to explain how or why the inventor's declaration failed to overcome the rejection, and this was error. See In re Alton, 76 F.3d 1168, 1175, 37 USPQ2d 1578 (Fed. Cir. 1996) ("The examiner also erred by dismissing the Wall declaration without an adequate explanation of how the declaration failed to overcome . . . the rejection on the ground that the application failed to describe the subject matter of claim 70."). The applicant's response to the final rejection pointed to specific language of the original disclosure and provided a detailed

explanation, supported by the inventor's declaration, as to how that specific language – while not using the identical terms as appear in the claims – describes the subject matter of the rejected claims. "If . . . the specification contains a description of the claimed invention, albeit not *in ipsis verbis* (in the identical words), then the examiner or Board, in order to meet the burden of proof, must provide reasons why one of ordinary skill in the art would not consider the description sufficient." Id. (citations omitted, emphasis added).

Appellant will again demonstrate, relying on specific language of the original specification and the declaration by the inventor Jon Tschudi, that all limitations of the claims are, in fact, supported by the original specification.

The allegedly unsupported claim passages are set forth below, followed by a quotation of supporting text from the specification, followed by an explanation of the meaning of the supporting specification text. The explanation is supported by the Declaration under 37 C.F.R. §1.132 of the inventor Jon Tschudi (hereafter "Tschudi Decl.") filed on June 20, 2003 along with the response to the Office Action of February 25, 2003. The explanation is believed to be helpful because the specification was written by a person for whom English is not his native language. Thus, the specification includes somewhat non-idiomatic English with terminology that has a specific meaning in the context of the present application as would be understood by a person of ordinary skill in the art.

Claim 15

The Examiner contends that the following language of independent claim 15 is not adequately described in the original specification. See Paper No. 13 at 2.

> *determining which of the plurality of images overlap or partially overlap others of the plurality of images;*
>
> *disregarding those images which overlap or partially overlap one or more other images; and*
>
> *constructing a two-dimensional image of the fingerprint surface from only non-overlapping images obtained from said generating step.*

Claim 24

The Examiner contends that the following language of independent claim 24 is not adequately described in the original specification. See Paper No. 13 at 3.

> *using the ascertained speed to determine which of the plurality of images overlap or partially overlap others of the plurality of images;*
> *disregarding those images which overlap or partially overlap one or more other images; and*
> *constructing a two-dimensional image of the fingerprint surface from only non-overlapping images obtained from said generating step.*

Supporting Specification Text

Appellant submits that language of claims 15 and 24 quoted above is supported by at least the following excerpts of the original disclosure.

> [T]hus the movement of the finger in relation to the sensor array must be known, either by moving the finger or sensor array with a chosen speed, or by measuring the movement of the finger. (p.5, lines 4-7).
>
> * * *
>
> [T]he movement is measured by correlating or comparing the signals from the different sensor lines, and the time lapse or spatial shift between the measurements of corresponding structures in the surface is found. (p. 5, l. 19-23).
>
> * * *
>
> Another method for adjusting for the movement of the finger is to maintain the sampling rate at the sensor array, while adjusting the number of measured lines used in generating the segmented image of the surface, and thus the interval of the measurements according to movement in order to obtain at least one measurement of each portion of the surface. For example, if the fingerprint is moved slowly over the sensor, while the sampling or measuring frequency is high, the redundant data may simply be neglected and the image of the fingerprint is comprised by each second or third set of data. (p. 5, l. 25-35).
>
> * * *
>
> . . . moving the surface in relation to the sensor array in a direction perpendicular to the sensor array, so that the measurements are performed at different, or partially overlapping, portions of the surface, and, from said measurements at said line of sensors and said at least one sensor, calculating said movement,

> combining the measurements of the measured portions of the surface to provide a segmented, two-dimensional representation of said characteristics of the surface . . . . (original claim 1).
>
> * * *
>
> . . . the movement is measured by correlating the measurements from different measuring lines in order to find the time lapse or spatial shift between the similar structures at different lines of measuring points. (original claim 5).

Explanation of Meaning

In the context of the specification of this application, the term "movement" is synonymous with "speed." Tschudi Decl. ¶9. This is evident from, for example, the passage quoted at lines 19-23 of page 5. Correlating the signals (i.e., measurements, or images) generated by the different sensor lines and the time lapse or spatial shift between the lines will give the speed of movement of the finger surface across the sensor. Tschudi Decl. ¶9. It is also evident from the excerpts quoted from original claims 1 and 5. See In re Koller 613 F.2d 819, 823-24, 204 USPQ 702, 706 (CCPA 1980) (original claims constitute part of the original disclosure).

The specification further describes a method for adjusting for the movement (i.e., speed) of the finger by maintaining the sample rate while adjusting the number of lines (i.e., images) used in generating the segmented image. Since the sample rate is maintained, thereby keeping number of generated data measurement lines (i.e. images) the same, it is inherent in the disclosure that the only way to "adjust" the number of lines (i.e., images) used to generate the segmented image is to discard some of the lines. Tschudi Decl. ¶10; See also Standard Oil Co. v. Montedison S.p.A., 494 F. Supp. 370, 384, 206 USPQ 676 (D. Del. 1980), aff'd, 664 F.2d 356, 212 USPQ 327 (3d Cir. 1981), cert. denied, 456 U.S. 915 (1982) (stating that the claimed invention is described in the specification if the subject matter of the claim is inherent in the disclosure). The quoted portion of the specification further explains that the interval of measurements (i.e., the spacing between measured lines) is adjusted according to the

"movement" (i.e., speed) so that at least one measurement of each portion of the fingerprint surface is retained.[1] Tschudi Decl. ¶10.

In the example provided in the quoted text of this specification, it is inherent that slow finger movement combined with a high sampling frequency (i.e., sample rate) will result in redundant data (i.e., overlapping images). This is because slow finger movement with a high sampling rate can result in images being generated at time intervals that are less than the time required for the finger to move the width of the sensor line. Tschudi Decl. ¶11. Furthermore, original claim 1 recited that partially overlapping images are formed. The "redundant data" (i.e., overlapping images) is "neglected" (i.e., discarded) so that, in the example provided, the two-dimensional segmented image of the fingerprint is comprised by each second or third set of data (i.e., the image(s) between each second or third image are discarded). Tschudi Decl. ¶11.

Although the original specification does not describe the invention of claims 15 and 24 in precisely the same language as is used in those claims, the specification provides ample disclosure from which a person skilled in the art could recognize the invention of claims 15 and 24. No more is required of the specification. See In re Wilder, 736 F.2d 1516, 1520, 222 USPQ 369 (Fed. Cir. 1984) ("It is not necessary that the claimed subject matter be described identically . . . ."). "If a person of ordinary skill in the art would have understood the inventor to have been in possession of the claimed invention at the time of filing, even if every nuance of the claims is not explicitly described in the specification, then the adequate written description requirement is met." In re Alton, 76 F.3d at 1175.

The original disclosure reasonably conveys to a person skilled in the art that appellant was in possession of the subject matter of claims 15 and 24. Appellant therefore respectfully requests that the rejections of each of those claims – as well as the rejections of any claims depending therefrom – under 35 U.S.C. § 112, paragraph 1, be reversed.

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[1] It is noted that only claim 24 recites using the ascertained speed to identify overlapping images; claim 15 recites identifying overlapping images, but is not limited to identifying the overlapping images using the ascertained speed.

Claims 20 & 21

The Examiner contends that the following language of dependent claim 20 and independent claim 21 is not adequately described in the original specification. See Paper No. 13 at 3.

> *using the ascertained speed to determine the required relative positioning of at least a portion of the plurality of images to form a two dimensional image of the fingerprint surface larger than any one of the plurality of images.*

Supporting Specification Text

Appellant submits that language of claims 20 and 21 quoted above is supported by at least the following excerpts of the original disclosure.

> [T]he movement is measured by correlating or comparing the signals from the different sensor lines, and the time lapse or spatial shift between the measurements of corresponding structures in the surface is found. (p. 5, l. 19-23).
>
> * * *
>
> Another method for adjusting for the movement of the finger is to maintain the sampling rate at the sensor array, while adjusting the number of measured lines used in generating the segmented image of the surface, and thus the interval of the measurements according to movement in order to obtain at least one measurement of each portion of the surface. For example, if the fingerprint is moved slowly over the sensor, while the sampling or measuring frequency is high, the redundant data may simply be neglected and the image of the fingerprint is comprised by each second or third set of data. (p. 5, l. 25-35).
>
> * * *
>
> . . . moving the surface in relation to the sensor array in a direction perpendicular to the sensor array, so that the measurements are performed at different, or partially overlapping, portions of the surface, and, from said measurements at said line of sensors and said at least one sensor, calculating said movement,
>
> combining the measurements of the measured portions of the surface to provide a segmented, two-dimensional representation of said characteristics of the surface . . . . (original claim 1).

Explanation of Meaning

The text supporting this limitation of claims 20 and 21 is the same as the text supporting the allegedly unsupported limitations of claims 15 and 24. As explained above, this portion of the specification describes a method whereby a two-dimensional segmented image is formed using fewer than all the measured data lines in accordance with the movement (i.e., speed) of the fingerprint surface. Thus, based on the speed of movement of the fingerprint surface relative to the sensor, the relative positioning of the images of which the two-dimensional image is formed is determined. "[O]ne skilled in the art, reading the original disclosure, [would] reasonably discern the limitation at issue in [claims 20 and 21]." Crown Operations, Ldt. v. Solutia Inc., 289 F.3d 1367, 1376, 62 USPQ2d 1917 (Fed. Cir. 2002) (citations omitted).

The original disclosure reasonably conveys to a person skilled in the art that appellant was in possession of the subject matter of claims 20 and 21. Appellant therefore respectfully requests that the rejections of each of those claims – as well as the rejections of any claims depending therefrom – under 35 U.S.C. § 112, paragraph 1, be reversed.

Claim 25

The Examiner contends that the following language of independent claim 25 is not adequately described in the original specification. See Paper No. 13 at 3.

> *means for determining which of the plurality of images overlap or partially overlap others of the plurality of images from the speed determined by said two sensing elements and to disregard those images which overlap or partially overlap one or more other images; and*
>
> *means for constructing a two-dimensional image of the fingerprint surface from only non-overlapping images generated by said sensor array.*

Supporting Specification Text

Appellant submits that language of claim 25 quoted above is supported by at least the following excerpts of the original disclosure.

> [T]he movement is measured by correlating or comparing the signals from the different sensor lines, and the time lapse or spatial shift between the measurements of corresponding structures in the surface is found. (p. 5, l. 19-23).
>
> * * *
>
> Another method for adjusting for the movement of the finger is to maintain the sampling rate at the sensor array, while adjusting the number of measured lines used in generating the segmented image of the surface, and thus the interval of the measurements according to movement in order to obtain at least one measurement of each portion of the surface. For example, if the fingerprint is moved slowly over the sensor, while the sampling or measuring frequency is high, the redundant data may simply be neglected and the image of the fingerprint is comprised by each second or third set of data. (p. 5, l. 25-35).
>
> * * *
>
> . . . moving the surface in relation to the sensor array in a direction perpendicular to the sensor array, so that the measurements are performed at different, or partially overlapping, portions of the surface, and, from said measurements at said line of sensors and said at least one sensor, calculating said movement,
>
> combining the measurements of the measured portions of the surface to provide a segmented, two-dimensional representation of said characteristics of the surface . . . . (original claim 1).
>
> * * *
>
> . . . the movement is measured by correlating the measurements from different measuring lines in order to find the time lapse or spatial shift between the similar structures at different lines of measuring points. (original claim 5).
>
> * * *
>
> Figure 3 shows a simplified view of the apparatus according to the invention comprising conductors from the sensors 1 to an amplifier and multiplexer 8. The signal is then digitized in an A/D-converter 9 before the digital signal is sent to a computer 10 comprising any available computer program being able to analyse the signal. (p. 5, l. 39 - p. 6, l. 4, see also Figure 3).

Explanation of Meaning

The support for the functionality recited in apparatus claim 25 is described above with respect to the allegedly unsupported limitations of claims 15 and 24. That is, the original disclosure reasonably conveys to a person skilled in the art that the inventor was in possession of

a method of determining which of a plurality of partial fingerprint images overlap one another and thereafter constructing a two-dimensional image of the fingerprint from only non-overlapping images.

The specification further describes, in the text quoted above and in Figure 3, apparatus structure including: an amplifier and multiplexer, an A/D [analog to digital]-converter, and a programed computer. It is inherent in the original disclosure, as would be understood by a person of skill in the art, that the functionality recited in the rejected limitations of claim 25 is accomplished via software executed by the computer, thereby providing the "means for determining" and the "means for constructing." Tschudi Decl. ¶12.

The original disclosure reasonably conveys to a person skilled in the art that appellant was in possession of the subject matter of claim 25. Appellant therefore respectfully requests that the rejection of claim 25 – as well as the rejections of any claims depending therefrom – under 35 U.S.C. § 112, paragraph 1, be reversed.

B. PRIOR ART REJECTIONS OF CLAIMS 15 AND 16.

Claims 15 and 16 stand rejected under 35 U.S.C. §102(e) as being anticipated by Mainguet '114. See Paper No. 13 at 4. The rejection is improper and should be reversed for at least the following reasons.

It is noted that in assessing the patentability of the claims over the prior art, the Examiner did not consider those limitations which allegedly are not supported by the specification. See Paper No. 13 at 4. As demonstrated and explained above, however, all limitations are supported by the specification, and thus, all limitations should be considered in assessing patentability. Moreover, the Examiner's failure to consider limitations, including those allegedly not supported by the specification, was improper. "When evaluating claims for obviousness under 35 U.S.C. 103, all limitations of the claims must be considered and given weight, including limitations which do not find support in the specification as originally filed (i.e., new matter)." MPEP §

2143.03 at 2100-129 (citing Ex parte Grasselli, 231 USPQ 393 (Bd. App. 1984), aff'd mem., 738 F.2d 453 (Fed. Cir. 1984)).

Independent claim 15, in its entirety, is distinguishable from Mainguet '114 because Mainguet '114 does not describe, inter alia, a methodology for sensing a fingerprint which includes the steps of determining which of the plurality of images overlap or partially overlap, disregarding those images which overlap or partially overlap, and constructing a two-dimensional image of the fingerprint surface from only non-overlapping images.

The Mainguet disclosure, in fact, teaches away from the present invention. The Mainguet system and methodology specifically requires overlapping images from which a reconstituted image is created.

> There should be overlapping by at least one row between two successive images given by the sensor but, in practice, overlapping by about five to six rows appears to be necessary in order to overcome certain defects of the sensor and make the system more tolerant to losses of image quality, given that the average distance between two consecutive lines of the fingerprint is about 120 micrometers. The sensor must have a number of rows sufficient to enable the reconstitution, without excessive difficulty, of the complete image of the fingerprint.

Mainquet '114 at col. 5, lines 33-42. Mainguet thereafter employs a complex and computationally intensive algorithm to construct a fingerprint image from the overlapping partial images. As explained in the specification and illustrated in Figs. 5-12 of Mainguet, the algorithm constructs the fingerprint image by adjusting the relative positions of adjacent, overlapping images until the fingerprint features (as reflected in the partial images) in the overlapping portions of the adjacent partial images match with specified precision. See Mainguet '114 at col. 8, lines 31- 51; see also, Tschudi Decl. ¶13. The adjacent images must have overlapping portions, or the algorithm will not work.

The system and methodology claimed in this application, on the other hand, discards the overlapping images and constructs the fingerprint image only from non-overlapping images, so

the algorithm for constructing the image is simpler and less computationally intensive than Mainguet's. Tschudi Decl. ¶13.

Accordingly, Mainguet '114 does not anticipate independent claim 15, and thus, appellant respectfully requests that the rejection of claim 15 be reversed.

Dependent claim 16 is allowable as being dependent from allowable base claim 15.

C. PRIOR ART REJECTIONS OF CLAIMS 18 AND 19.

Claims 18 and 19 stand rejected under 35 U.S.C. §102(e) as being anticipated by Setlak '773. See Paper No. 13 at 5. The rejection is improper and should be reversed for at least the following reasons. Claim 18 recites a method of sensing a fingerprint comprising:

> applying a varying voltage to a finger positioned over an electrode; and
>
> measuring the capacitance or impedance between the electrode and a capacitive sensor array through a fingerprint surface positioned over the electrode and the capacitive sensor array, wherein the capacitive sensor array is separately disposed from the electrode and the capacitive sensor array is adapted to detect variations in capacitance or impedance across the array caused by structural features of a portion of the fingerprint surface positioned over the array. (emphasis added).

Setlak '773 does not disclose the recited combination of claim 18 and in particular does not disclose "applying a varying voltage to a finger" or "measuring the capacitance or impedance between the electrode and a capacitive sensor array through a fingerprint surface positioned over both the electrode and the capacitive sensor array, wherein the capacitive sensor array is separately disposed from the electrode."

Regarding the disclosure of Setlak '773, it is stated in the Office Action that "capacitance between electrode 71 and sensor array elements 78 through finger surface 79 is measured by the sensor elements." Paper No. 13 at 5. Appellant respectfully disagrees. As shown in Figure 8 in Setlak '773, the finger surface 79 is not placed over electrode 71 and sensor array 78, but is placed between array 78 and the external, grounded electrode 54. Tschudi Decl. ¶14. The

capacitance between electrode 71 and sensor 78 is constant and is independent of the finger. This capacitance is only affected by the electrode geometry and the dielectric between them. Thus, rather than measuring this capacitance, Setlak measures the changes in the field between the electrode and the sensor array depending on the presence of the finger. Tschudi Decl. ¶15.

It is also stated in the Office Action that "Figure 6 shows sensor array 78 and electrode 71 are disposed in separate layers." Paper No. 13 at 5. This arrangement of the sensor array 78 and electrode 71 does not, however, provide a system with a sensor array and a separately disposed electrode in which a signal passes from the electrode, through the finger, and to the sensor so that the capacitance or impedance between the electrode and the sensor array can be measured through the finger. The signal in Setlak passes directly from the electrode 71 to the sensor array 78. Setlak '773, at col. 6, ln. 66 - col. 7, ln. 1; Fig. 8; See also Tschudi Decl. ¶16.

In the present invention, as recited in claim 18, a voltage (i.e., a reference potential) is applied at conductive material (2) surrounding the sensor array (1) (i.e., a separately disposed electrode). See Pg. 3, ln. 35 - Pg. 4, ln. 2 and Pg. 6, lns. 14-17; Fig. 3. The sensor array measures the signal passing from the conductive material through the finger, and this signal is indicative of the capacitance and/or the impedance through the finger. The signal to the sensor array exists only when the finger is placed over the sensor array and the electrode. Pg. 6, lns. 35-36; See also Tschudi Decl. ¶17.

Setlak, on the other hand, does not apply a varying voltage to the finger. In Setlak, the excitation signal is constantly applied to the sensor. Tschudi Decl. ¶18. "The excitation drive signal . . . is coherently delivered across all of the array." Setlak '773 at col. 6, lns. 40-42. This can also be appreciated from Figure 9 of Setlak, which shows that the excitation signal is applied to the capacitive element 83 (which is defined between the excitation electrode 71 and the sensing electrode 78, see Setlak '773 at col. 7, lns. 3-5), and the signal output is constantly measured through amplifier 73. Tschudi Decl. ¶18. The measured signal varies when variable capacitor 85 (which is defined between the finger 79 and the ground, see Setlak '773 at col. 7, lns. 5-7) is placed on the sensor, and the amount of variation depends on whether the particular

sensor is near a ridge or valley of the fingerprint surface. See Setlak '773 at col. 7, lns. 7-9. Thus, the fingerprint characteristics are derived from the amount of signal variation that occurs when a fingerprint is placed on the sensor.

The claimed system and method, on the other hand, derives the fingerprint characteristics from the absolute strength of a signal (as opposed to the relative variation) that exists only when the finger is placed on both the exciting electrode and the sensor array. Tschudi Decl. ¶¶17, 20-21. As compared to Setlak's sensor, the sensor of the present invention is much more sensitive to actual fingerprint characteristics while being less sensitive to environmental variations. Tschudi Decl. ¶20-21.

The differences between the present invention and the sensor of Setlak can be effectively illustrated by a simple example. The Setlak sensor is analogous to a circuit that powers a light bulb. The light bulb is constantly illuminated, but if one were to place his finger on the circuit, the intensity of the light bulb would change. It is the change in intensity the Setlak measures to derive the fingerprint characteristics. Tschudi Decl. ¶22. The present invention is analogous to a light bulb circuit that is open until one completes the circuit with his finger to cause the bulb to illuminate. The sensor of the present invention derives the fingerprint characteristics from the intensity of the bulb, not the change in intensity. Tschudi Decl. ¶22.

Accordingly, claim 18, and claim 19 depending therefrom, are not anticipated by the teachings of Setlak '773. Appellant therefore respectfully requests that the rejections of claims 18 and 19 be reversed.

D. PRIOR ART REJECTIONS OF CLAIMS 20 AND 24

Claims 20 and 24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Setlak '773 in view of Mainguet '114 and Upton '296. The rejections are improper and should be reversed for at least the following reasons.

It is noted that in assessing the patentability of claims 20 and 24, the Examiner did not consider those limitations which were allegedly not supported by the specification. As

demonstrated and explained above, however, all limitations are supported by the specification, and thus, all limitations should be considered in assessing patentability. Moreover, failure to consider all limitations of the claims was improper. See MPEP §2143.03 (*supra*).

Claim 20 recites the steps of ascertaining the speed of movement of the fingerprint by sensing structural features of the fingerprint surface moved over two sensing elements spaced apart by a predetermined distance and determining the speed from the predetermined distance and a time lapse between passage of identical structural features. The ascertained speed is thereafter used to determine the required relative positioning of at least a portion of the plurality of images to form a two-dimensional image of the fingerprint surface. The subject matter of claim 20 is not rendered obvious from the teachings of Setlak, Mainguet, and Upton.

Claim 20 depends from claim 18 and is therefore believed to be allowable as depending from an allowable claim. In addition, claim 20 is believed to be allowable for the following independent reasons.

Mainguet describes a low cost sensor comprising only one row of sensitive elements and explains that in order to obtain an undistorted reconstitution of the complete image of the fingerprint, it would be necessary to have precise knowledge of the speed of relative shift of the finger with respect to the sensor. See Mainguet '114 at col.4, ln 62 - col. 5, ln 3. Mainguet does not, however, explain how one can use knowledge of the speed of the finger relative to the sensor to obtain an undistorted reconstitution of the complete image and does not suggest that the speed of the finger can be determined by the sensor. Moreover, the only manner described for knowing the speed of the finger relative to the sensor is by moving the sensing elements at a known speed relative to a stationary finger using a servo-controlled motor. Id. at col. 5, lns 3-7. There is no suggestion, however, that the servo-controlled motor is controlled by the output of the sensors, so there is no evaluation of the speed of the finger by the sensors. In the preferred embodiment described in Mainguet '114, in which the sensor comprises several rows of sensitive elements, knowledge of the speed of the finger movement relative to the sensor is not required. Adjacent images are put together by adjusting their relative positions until the fingerprint features

found in the overlapping areas match. Mainguet '114 at col. 8, lns. 31-51; see also Tschudi Decl. ¶13.

Upton '296 describes that the rows of sensing elements are spaced at a predetermined distance which allows a "fingerprint velocity function" to be measured. Upton '296 at col. 4, lns 15-17. Upton does not explain what a "fingerprint velocity function" is or how it is measured. Thus, Upton does not enable the "ascertaining" step of claim 20.

In addition, Upton does not describe that the "velocity function" can be used to determine the relative positions of partial images. Upton describes that the velocity is measured to optimize the sample frequency to provide a fingerprint detection and verification method that is independent of fingertip velocity. Id. at col. 8, lns 15-39.

Accordingly, the combined disclosures of Mainguet and Upton do not describe a process whereby the speed of movement of the fingerprint is ascertained by sensing structural features of the fingerprint surface moved over two sensing elements spaced apart by a predetermined distance and determining the speed from the predetermined distance and a time lapse between passage of identical structural features of the fingerprint surface from one of the two sensing elements to the other and using the ascertained speed to determine the required relative positioning of at least a portion of the plurality of images to form a two-dimensional image of the fingerprint surface.

Accordingly, claim 20 is not obvious from Mainguet '114, Upton '296, and Setlak '773, and thus, appellant respectfully requests that the rejection of claim 20 be reversed.

Claim 24 recites applying a varying voltage to a finger positioned over an electrode and measuring the capacitance or impedance between the electrode and a separately disposed sensor array through the finger, ascertaining the speed of movement of the fingerprint surface relative to the sensor array by sensing structural features of the fingerprint surface moved over two sensing elements spaced by a predetermined distance and determining the speed from the predetermined distance and a time lapse between passage of identical structural features of the fingerprint, using the ascertained speed to determine which of the plurality of images overlap or partially overlap

others of the plurality of images, disregarding those images which overlap or partially overlap, and constructing a two-dimensional image of the fingerprint surface from only non-overlapping images. The cited references do not disclose all of these process steps.

As explained above with respect to claim 18, Setlak does not describe a system or methodology for applying a varying voltage to the finger and measuring the capacitance or impedance through a finger placed over the electrode and a separately disposed sensor array. And, as explained above with respect to claim 20, Upton and Mainguet do not, either individually or in combination, teach or suggest the steps of ascertaining the speed by measuring the time lapse between passage of identical structural features. Finally, as explained above with respect to claim 15, Mainguet does not teach or suggest the steps of determining overlapping images, disregarding overlapping images, or constructing a two-dimensional image from only non-overlapping images.

Therefore, claim 24 is not obvious from Mainguet '114, Upton '296, and Setlak '773, and thus, appellant respectfully requests that the rejection of claim 24 be reversed.

E. PRIOR ART REJECTIONS OF CLAIMS 21-23 AND 25

Claims 21-23 and 25 stand rejected under 35 U.S.C. §103 as being unpatentable over Mainguet '114 and Upton '296. The rejections are improper and should be reversed for at least the following reasons.

It is noted that in assessing the patentability of claims 21-23 and 25, the Examiner did not consider those features allegedly not supported by the specification. As demonstrated and explained above, however, all limitations are supported by the specification, and thus, all limitations should be considered in assessing patentability. Moreover, failure to consider all limitations was improper. See MPEP §2143.03 (*supra*).

Claim 21 recites ascertaining the speed of movement of the fingerprint surface relative to the sensor array by sensing structural features of the fingerprint surface moved over two sensing elements spaced apart by a predetermined distance and determining the speed from the

predetermined distance and a time lapse between passage of identical structural features, and using the ascertained speed to determine the required relative positioning of at least a portion of the plurality of images to form a two-dimensional image of the fingerprint surface.

As explained above, while Mainguet mentions that knowledge of the speed of the finger relative to the sensor is necessary to obtain an undistorted reconstituted image, it does not explain how the undistorted image is obtained (once the speed is known) or how the speed is measured.

Upton '296 describes a methodology and apparatus whereby a sample trajectory signal is normalized by correcting the sampling rate in direct proportion to the sample trajectory signal frequency. Thus, an increase in fingertip velocity across the sensing array will cause a proportional increase in the sampling rate, and a decrease in fingertip velocity will cause a proportional decrease in the sampling rate. Upton '296 at col. 8, lns 15-39. There is no disclosure in Upton '296 of using the ascertained speed to determine the required relative positioning of at least a portion of the plurality of images. Moreover, while Upton mentions measuring a fingerprint velocity function, it does not explain what such a function is or how it is measured.

Accordingly, the subject matter of claim 21 is not obvious from the teachings of Mainguet '114 and Upton '296, and thus, appellant respectfully requests that the rejection of claim 21 be reversed.

Claims 22-23 depend from claim 21 and are allowable as depending from an allowable base claim.

Claim 25 is an apparatus claim which recites (a) sensing elements constructed and arranged to measure structural features passing over the elements, to determine a time lapse between passage of identical structural features, and to determine the speed of movement of the fingerprint from the time lapse and the distance between the sensing elements, (b) means for determining which of the plurality of images overlap and to disregard those images which overlap, and (c) means for constructing a two-dimensional image of the fingerprint from only non-overlapping images. Neither of the cited references, Mainguet '114 or Upton '296, discloses

structure providing the claimed functionality. Mainguet does not describe an apparatus that constructs a fingerprint image only from non-overlapping images, and, in fact, describes an apparatus that requires overlapping images for constructing the fingerprint image. Upton does not describe an apparatus for determining the speed of finger movement based on the distance between spaced-apart sensors and the time lapse between passage of identical features over the sensors.

Accordingly, the subject matter of claim 25 is not obvious from the teachings of Mainguet '114 and Upton '296, and thus, appellant respectfully requests that the rejection of claim 25 be reversed.

F. PRIOR ART REJECTIONS OF CLAIMS 26-28.

Claims 26-28, depending from claim 25, are rejected under 35 U.S.C. §103(a) as being unpatentable over Mainguet '114, Upton '296 and Setlak '773. The rejections are improper and should be reversed for at least the following reasons.

It is noted that in assessing the patentability of claims 26-28, the Examiner did not consider those features allegedly not supported by the specification. As demonstrated and explained above, however, all limitations are supported by the specification, and thus, all limitations should be considered in assessing patentability. Moreover, failure to consider all limitations was improper. See MPEP §2143.03 (*supra*).

Claims 26-28 are believed to be allowable as being dependent from allowable base claim 25, there being nothing in the teachings of Setlak to overcome the deficiencies of Mainguet and Upton with respect to the subject matter of independent claim 25. Accordingly, appellant respectfully requests that the rejections of claims 26-28 be reversed.

CONTINGENT AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT AND

CONTINGENT PETITION FOR EXTENSION OF TIME

The present Brief on Appeal is being filed in triplicate. Unless a check is submitted herewith for the fee required under 37 C.F.R. §1.192(a) and 1.17(c), please charge said fee to Deposit Account No. 02-2135.

Appellants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 02-2135.

Respectfully submitted,

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APPENDIX

CLAIMS:

1.- 14. (cancelled January 29, 2003)

15. (rejected, on appeal) A method for sensing a fingerprint comprising:

generating a plurality of images of different portions of a fingerprint surface by measuring structural features of the fingerprint surface at given intervals of time with an essentially one-dimensional sensor array as the fingerprint surface is moved relative to the sensor array in a direction that is generally perpendicular to the sensor array;

determining which of the plurality of images overlap or partially overlap others of the plurality of images;

disregarding those images which overlap or partially overlap one or more other images; and

constructing a two-dimensional image of the fingerprint surface from only non-overlapping images obtained from said generating step.

16. (rejected, on appeal) The method of claim 15, wherein said measuring is performed at each of a plurality of equally spaced measuring points arranged in at least one line corresponding to the essentially one-dimensional sensor array.

17. (rejected, on appeal) The method of claim 15, wherein said measuring is performed simultaneously at each of a plurality of equally spaced measuring points arranged in at least two generally parallel lines spaced apart by a distance different from the distance separating the measuring points, wherein the measuring points of one line are shifted with respect to the measuring points of the next line, and wherein said generating is performed from measurements performed at one of the at least two lines.

18. (rejected, on appeal) A method of sensing a fingerprint comprising:

applying a varying voltage to a finger positioned over an electrode; and

measuring the capacitance or impedance between the electrode and a capacitive sensor array through a fingerprint surface positioned over both the electrode and the capacitive sensor array, wherein the capacitive sensor array is separately disposed from the electrode and the capacitive sensor array is adapted to detect variations in capacitance or impedance across the array caused by structural features of a portion of the fingerprint surface positioned over the array.

19.(rejected, on appeal) The method of claim 18, further comprising forming a two-dimensional image representative of the structural features of at least a portion of the fingerprint surface using the variations in capacitance or impedance detected in said measuring step.

20. (rejected, on appeal) The method of claim 18, further comprising:

generating a plurality of images of different portions of a fingerprint surface by measuring structural features of the fingerprint surface at given intervals of time with a sensor array as the fingerprint surface is moved relative to the sensor array;

ascertaining the speed of movement of the fingerprint surface relative to the sensor array at each of the given intervals of time by sensing structural features of the fingerprint surface moved over two sensing elements spaced apart by a predetermined distance and determining the speed from the predetermined distance and a time lapse between passage of identical structural features of the fingerprint surface from one of the two sensing elements to the other; and

using the ascertained speed to determine the required relative positioning of at least a portion of the plurality of images to form a two dimensional image of the fingerprint surface larger than any one of the plurality of images.

21. (rejected, on appeal) A method for sensing a fingerprint comprising:

generating a plurality of images of different portions of a fingerprint surface by measuring structural features of the fingerprint surface at given intervals of time with a sensor array as the fingerprint surface is moved relative to the sensor array;

ascertaining the speed of movement of the fingerprint surface relative to the sensor array at each of the given intervals of time by sensing structural features of the fingerprint surface moved over two sensing elements spaced apart by a predetermined distance and determining the speed from the predetermined distance and a time lapse between passage of identical structural features of the fingerprint surface from one of the two sensing elements to the other; and

using the ascertained speed to determine the required relative positioning of at least a portion of the plurality of images to form a two dimensional image of the fingerprint surface larger than any one of the plurality of images.

22. (rejected, on appeal) The method of claim 21, wherein one of the two sensing elements comprises a sensor in the sensor array.

23. (rejected, on appeal) The method of claim 21, wherein each of the two sensing elements is disposed in a different one of two groups of sensing elements arranged in two spaced-apart, generally parallel lines of sensing elements.

24. (rejected, on appeal) A method for sensing a fingerprint comprising:

applying a varying voltage to a finger positioned over an electrode;

measuring the capacitance or impedance between the electrode and an essentially one-dimensional capacitive sensor array through a fingerprint surface positioned over both the electrode and the capacitive sensor array, wherein the capacitive sensor array is separately disposed from the electrode and the array of capacitive sensors is adapted to detect variations in capacitance or impedance across the array caused by structural features of a portion of the fingerprint surface positioned over the array;

generating a plurality of images of different portions of a fingerprint surface by measuring structural features of the fingerprint surface at given intervals of time with the capacitive sensor array as the fingerprint surface is moved relative to the sensor array in a direction that is generally perpendicular to the sensor array;

ascertaining the speed of movement of the fingerprint surface relative to the sensor array by sensing structural features of the fingerprint surface moved over two sensing elements spaced apart by a predetermined distance and determining the speed from the predetermined distance and a time lapse between passage of identical structural features of the fingerprint surface over the two sensing elements;

using the ascertained speed to determine which of the plurality of images overlap or partially overlap others of the plurality of images;

disregarding those images which overlap or partially overlap one or more other images; and

constructing a two-dimensional image of the fingerprint surface from only non-overlapping images obtained from said generating step.

25. (rejected, on appeal) An apparatus for sensing a fingerprint comprising:

an essentially one-dimensional sensor array and associated circuitry constructed and arranged to generate a plurality of images of different portions of a fingerprint surface by measuring structural features of the fingerprint surface at given intervals of time as the fingerprint surface is moved relative to said sensor array in a direction that is generally perpendicular to said sensor array;

at least one pair of sensing elements, where the sensing elements in each pair are spaced apart by a predetermined distance and are constructed and arranged to sense structural features of the fingerprint surface moved over said two sensing elements of each pair, to determine a time lapse between passage of identical structural features over one sensing element and then the

other, and to determine the speed of movement of the fingerprint surface relative to the sensor array from the predetermined distance and the time lapse;

means for determining which of the plurality of images overlap or partially overlap others of the plurality of images from the speed determined by said two sensing elements and to disregard those images which overlap or partially overlap one or more other images; and

means for constructing a two-dimensional image of the fingerprint surface from only non-overlapping images generated by said sensor array.

26. (rejected, on appeal) The apparatus of claim 25, further comprising an electrode and associated circuitry constructed and arranged to apply a varying voltage to a finger positioned over said electrode, wherein said sensor array is separately disposed from said electrode, and wherein said sensor array is a constructed and arranged to measure the capacitance or impedance between said electrode and said sensor array through a fingerprint surface positioned over both said electrode and said sensor array and to detect variations in capacitance or impedance across said array caused by structural features of a portion of the fingerprint surface positioned over said array.

27. (rejected, on appeal) The apparatus of claim 25, wherein one of the two sensing elements of each pair comprises a sensor in the sensor array.

28. (rejected, on appeal) The apparatus of claim 25, wherein each of the two sensing elements of each pair is disposed in a different one of two groups of sensing elements arranged in two spaced-apart, generally parallel lines of sensing elements.